Amendments to the Claims

Claims 1-63.   (cancelled)

Claim 64.   (currently amended) <u>A biometric sensing apparatus, comprising:</u>

<u>a sensor having at least one hundred thousand approximately rectangular piezoelectric ceramic elements, each piezoelectric ceramic element having a size equal to or less than approximately forty microns by forty microns by one hundred microns, said sensor being responsive to features of a finger proximate to said sensor; and</u>

<u>a processor, coupled to said sensor, that receives data from said sensor and produces an output representative of features of the finger,</u>

[The apparatus of claim 54,] wherein said sensor operates in a Doppler-shift mode to produce Doppler-shift data, and said processor includes a Doppler-shift detector that processes Doppler-shift data received from said sensor to produce a second output.

Claim 65.   (previously amended) The apparatus of claim 64, wherein the second output is data representing blood flow.

Claim 66.   (previously amended) The apparatus of claim 65, wherein the second output is data representing arteriole blood flow.

Claim 67.   (previously amended) The apparatus of claim 65, wherein the second output is data representing capillary blood flow.

Claim 68.   (currently amended) <u>A biometric sensing apparatus, comprising:</u>

<u>a sensor having at least one hundred thousand approximately rectangular piezoelectric ceramic elements, each piezoelectric ceramic element having a size equal to or less than approximately forty microns by forty microns by one hundred microns, said sensor being responsive to features of a finger proximate to said sensor; and</u>

<u>a processor, coupled to said sensor, that receives data from said sensor and produces an output representative of features of the finger,</u>

[The apparatus of claim 54,] wherein said sensor operates in an echo mode to produce echo data, and said processor includes a signal-time-of-travel detector that processes echo data received from said sensor to produce a second output.

Claim 69.   (previously added) The apparatus of claim 68, wherein the second output is data representing an arteriole-veinal map.

Claim 70.   (previously added) The apparatus of claim 68, wherein the second output is data representing a bone map.

Claim 71.   (currently amended) <u>A biometric sensing apparatus, comprising:</u>

<u>a sensor having at least one hundred thousand approximately rectangular piezoelectric ceramic elements, each piezoelectric ceramic element having a size equal to or less than approximately forty microns by forty microns by one hundred microns, said sensor being responsive to features of a finger proximate to said sensor; and</u>

<u>a processor, coupled to said sensor, that receives data from said sensor and produces an output representative of features of the finger,</u>

[The apparatus of claim 54,] wherein said sensor operates in a voltage mode to produce voltage data, and said processor includes a voltage detector that processes voltage data received from said sensor to produce a second output.

Claim 72.   (previously added) The apparatus of claim 71, wherein the second output is data representing a fingerprint pattern.

Claim 73.   (cancelled)

Claim 74.   (cancelled)

Claim 75.   (currently amended) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array, said piezoelectric ceramic elements of said array being spaced on a pitch equal to or less than approximately 50 microns to detect features of a finger proximate to said array; and

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output,

[The apparatus of claim 1,] wherein said sensor operates in a Doppler-shift mode to produce Doppler-shift data, and said processor includes a Doppler-shift detector that processes Doppler-shift data received from said sensor to produce a second output.

Claim 76.   (previously added) The apparatus of claim 75, wherein the second output is data representing blood flow.

Claim 77.   (previously added) The apparatus of claim 76, wherein the second output is data representing arteriole blood flow.

Claim 78.   (previously added) The apparatus of claim 76, wherein the second output is data representing capillary blood flow.

Claim 79.   (currently amended) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array, said piezoelectric ceramic elements of said array being spaced on a pitch equal to or less than approximately 50 microns to detect features of a finger proximate to said array; and

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output,

[The apparatus of claim 1,] wherein said sensor operates in an echo mode to produce echo data, and said processor includes a signal-time-of-travel detector that processes echo data received from said sensor to produce a second output.

Claim 80.   (previously added) The apparatus of claim 79, wherein the second output is data representing an arteriole-veinal map.

Claim 81.   (previously added) The apparatus of claim 79, wherein the second output is data representing a bone map.

Claim 82.   (currently amended) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array, said piezoelectric ceramic elements of said array being spaced on a pitch equal to or less than approximately 50 microns to detect features of a finger proximate to said array; and

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output,

[The apparatus of claim 1,] wherein said sensor operates in a voltage mode to produce voltage data, and said processor includes a voltage detector that processes voltage data received from said sensor to produce a second output.

Claim 83.   (previously added) The apparatus of claim 82, wherein the second output is data representing a fingerprint pattern.

Claim 84.   (currently amended) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array, said piezoelectric ceramic elements of said array being spaced on a pitch equal to or less than approximately 50 microns to detect features of a finger proximate to said array;

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output; and [The apparatus of claim 1, further comprising:]

an input signal generator that applies an AC voltage signal across said plurality of piezoelectric ceramic elements.

Claim 85.   (currently amended) A biometric sensing apparatus, comprising:

a sensor having at least one hundred thousand approximately rectangular piezoelectric ceramic elements, each piezoelectric ceramic element having a size equal to or less than approximately forty microns by forty microns by one hundred microns, said sensor being responsive to features of a finger proximate to said sensor; and

a processor, coupled to said sensor, that receives data from said sensor and produces an output representative of features of the finger; and [The apparatus of claim 54, further comprising:]

an input signal generator that applies an AC voltage signal across said at least one hundred thousand approximately rectangular piezoelectric ceramic elements.

Claims 86-95. (cancelled)

Claim 96.   (new) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array and spaced on a pitch equal to or less than approximately two hundred microns to detect features of a finger proximate to said array; and

a processor, coupled to said sensor, that receives data from said sensor and produces an output representative of features of the finger,

wherein said sensor operates in a Doppler-shift mode to produce Doppler-shift data, and said processor includes a Doppler-shift detector that processes Doppler-shift data received from said sensor to produce a second output.

Claim 97.   (new) The apparatus of claim 96, wherein the second output is data representing blood flow.

Claim 98.   (new) The apparatus of claim 97, wherein the second output is data representing arteriole blood flow.

Claim 99.   (new) The apparatus of claim 97, wherein the second output is data representing capillary blood flow.

Claim 100.   (new) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array and spaced on a pitch equal to or less than approximately two hundred microns to detect features of a finger proximate to said array; and

a processor, coupled to said sensor, that receives data from said sensor and produces an output representative of features of the finger,

wherein said sensor operates in an echo mode to produce echo data, and said processor includes a signal-time-of-travel detector that processes echo data received from said sensor to produce a second output.

Claim 101.   (new) The apparatus of claim 100, wherein the second output is data representing an arteriole-veinal map.

Claim 102.   (new) The apparatus of claim 100, wherein the second output is data representing a bone map.

Claim 103.   (new) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array and spaced on a pitch equal to or less than approximately two hundred microns to detect features of a finger proximate to said array; and

a processor, coupled to said sensor, that receives data from said sensor and produces an output representative of features of the finger,

wherein said sensor operates in a voltage mode to produce voltage data, and said processor includes a voltage detector that processes voltage data received from said sensor to produce a second output.

Claim 104.   (new) The apparatus of claim 103, wherein the second output is data representing a fingerprint pattern.

Claim 105.   (new) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having at least fifty thousand piezoelectric ceramic elements arranged in an array to detect features of a finger proximate to said array; and

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output,

wherein said sensor operates in a Doppler-shift mode to produce Doppler-shift data, and said processor includes a Doppler-shift detector that processes Doppler-shift data received from said sensor to produce a second output.

Claim 106.   (new) The apparatus of claim 105, wherein the second output is data representing blood flow.

Claim 107.   (new) The apparatus of claim 106, wherein the second output is data representing arteriole blood flow.

Claim 108.   (new) The apparatus of claim 106, wherein the second output is data representing capillary blood flow.

Claim 109.   (new) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having at least fifty thousand piezoelectric ceramic elements arranged in an array to detect features of a finger proximate to said array; and

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output,

wherein said sensor operates in an echo mode to produce echo data, and said processor includes a signal-time-of-travel detector that processes echo data received from said sensor to produce a second output.

Claim 110.   (new) The apparatus of claim 109, wherein the second output is data representing an arteriole-veinal map.

Claim 111.   (new) The apparatus of claim 109, wherein the second output is data representing a bone map.

Claim 112.   (new) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having at least fifty thousand piezoelectric ceramic elements arranged in an array to detect features of a finger proximate to said array; and

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output,

wherein said sensor operates in a voltage mode to produce voltage data, and said processor includes a voltage detector that processes voltage data received from said sensor to produce a second output.

Claim 113.   (new) The apparatus of claim 112, wherein the second output is data representing a fingerprint pattern.

Claim 114.   (new) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having a plurality of piezoelectric ceramic elements arranged in an array and spaced on a pitch equal to or less than approximately two hundred microns to detect features of a finger proximate to said array;

a processor, coupled to said sensor, that receives an input from said sensor representative of features of the finger and produces an output; and

an input signal generator that applies an AC voltage signal across said plurality of piezoelectric ceramic elements.

Claim 115.   (new) The apparatus of claim 114, wherein the output is data representing a fingerprint pattern.

Claim 116.   (new) The apparatus of claim 114, wherein the output is data representing blood flow.

Claim 117.   (new) The apparatus of claim 116, wherein the output is data representing arteriole blood flow.

Claim 118.   (new) The apparatus of claim 116, wherein the output is data representing capillary blood flow.

Claim 119.   (new) The apparatus of claim 114, wherein the output is data representing an arteriole-veinal map.

Claim 120.   (new) The apparatus of claim 114, wherein the output is data representing a bone map.

Claim 121.   (new) A biometric sensing apparatus, comprising:

a piezoelectric ceramic sensor having at least fifty thousand piezoelectric ceramic elements arranged in an array and spaced on a pitch equal to or less than approximately two hundred microns to detect features of a finger proximate to said array; and

a processor, coupled to said sensor, that receives data from said sensor and produces an output representative of features of the finger; and

an input signal generator that applies an AC voltage signal across said at least fifty thousand piezoelectric ceramic elements.

Claim 122.   (new) The apparatus of claim 121, wherein the output is data representing a fingerprint pattern.

Claim 123.   (new) The apparatus of claim 121, wherein the output is data representing blood flow.

Claim 124.   (new) The apparatus of claim 123, wherein the output is data representing arteriole blood flow.

Claim 125.   (new) The apparatus of claim 123, wherein the output is data representing capillary blood flow.

Claim 126.   (new) The apparatus of claim 121, wherein the output is data representing an arteriole-veinal map.

Claim 127.   (new) The apparatus of claim 121, wherein the output is data representing a bone map.